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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/827,489	04/19/2004	Charles A. Mistretta	960296.00092	3311

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QUARLES & BRADY LLP
411 E. WISCONSIN AVENUE
SUITE 2040
MILWAUKEE, WI 53202-4497

EXAMINER	
KAO, CHIH CHENG G	
ART UNIT	**PAPER NUMBER**
2882	

DATE MAILED: 06/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/827,489	MISTRETTA ET AL.	
	Examiner	Art Unit	
	Chih-Cheng Glen Kao	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 April 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/19/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: (fig. 1, #11) and (fig. 1, #38).

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The specification is objected to because of the following informalities, which appear to be minor draft errors including drawing inconsistencies and grammatical issues.

In the following format (location of objection; suggestion for correction), the following corrections may obviate their respective objections: (paragraph 11, line 3, "5,504,791; 5,504,791;"; deleting one instance of "5,504,791;"), (paragraph 11, line 4, "and 4,158,142 the

electron beam"; inserting a comma after "4,158,142"), (paragraph 22, line 1, "Figs. 5A and 5D"; replacing "and" with - -through- -), and (paragraph 38, line 11, "82 of ??? elements"; deleting "???").

Appropriate correction is required.

Claim Objections

3. Claims 3, 5, 16, 17, and 19 are objected to because of the following informalities, which appear to be minor draft errors including grammatical and lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following corrections may obviate their respective objections: (claim 3, line 3, "the electron beam"; replacing "the" with - -an- -), (claim 5, lines 3-4, "moved a plurality of times along the full extent of the axial dimension a plurality of times"; deleting one instance of "a plurality of times"), (claim 16, line 7, "the scan pattern"; replacing "the" with - -a- -), (claim 17, line 2, "all the k-space data"; inserting - - of- - after "all"), and (claim 19, line 7, "the scan pattern"; replacing "the" with - -a- -).

For purposes of examination, the claims have been treated as such. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 16-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 16 recites the limitation "the acquired attenuation data sets" in line 13. The antecedent basis for this limitation is unclear. In line 9, "a first attenuation data set" is recited. In line 11, "additional attenuation data sets" are recited. It is unclear to which limitation "the acquired attenuation data sets" is referring, the first attenuation data set and the additional attenuation data sets or just the additional attenuation data sets. Therefore, claims 16-18 have been rejected for being indefinite.

6. Claims 16 and 19 recite the limitation "it" in lines 3, 7, and 8 of both claims. The antecedent basis for these limitations is unclear. The limitation "it" can refer to almost any noun preceding the word "it". For example, in claim 16, lines 3-4, the claim recites "directing it into a region of interest". It is unclear what is directed into a region of interest. Is the computer tomography system directed into a region of interest? Is the cone beam of x-rays directed into a region? Perhaps it is the x-ray source being directed into a region of interest. Since it is not clear what "it" refers to, claims 16-21 have been rejected for being indefinite.

7. Claims 19-21 recite the limitation "said attenuation data sets" in lines in lines 9, 2-3, and 1, respectively. The antecedent basis for these limitations is unclear. In line 9 of claim 19, "a first attenuation data set" is recited. In line 11 of claim 19, "additional attenuation data sets" are

recited. It is unclear to which limitation "said acquired attenuation data sets" is referring, the first attenuation data set and the additional attenuation data sets or just the additional attenuation data sets. Therefore, claims 19-21 have been rejected for being indefinite.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 3, 7-11, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzara et al. (US Patent 5712889) in view of Ooshima (JP 06-125888).

9. Regarding claim 1, Lanzara et al. discloses a method comprising the steps of a) producing a beam of x-rays (col. 2, lines 60-62) with an x-ray source (fig. 1, #12) and directing it into a region of interest (fig. 1, #11) in accordance with a prescribed scan pattern; and b) detecting x-rays in the beam (fig. 1, #26) after they have passed through the region of interest (fig. 1, #11); wherein the x-ray source is mechanically moved around the region of interest when performing the prescribed scan pattern (fig. 3, #12, and col. 3, lines 34-39) and a focal point of the beam of x-rays (fig. 1, focal point on #21) is electronically moved to positions along an axial dimension of the region of interest when performing the prescribed scan pattern (col. 2, lines 60-62).

However, Lanzara et al. does not disclose cone beams.

Ooshima teaches cone beams (title and fig. 7, #17).

Ooshima teaches cone beams (title and fig. 7, #17).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Lanzara et al. with the cone beams of Ooshima, since one would be motivated to make such a modification for reducing artifacts (abstract, purpose) as implied from Ooshima and saving time.

10. Regarding claim 3, Lanzara et al. further discloses wherein the x-ray source (fig. 1, #12) is comprised of an electron gun (fig. 1, #17) and an anode (fig. 1, #21) and the beam of x-rays is produced by directing the electron beam at a focal point on the anode (col. 2, lines 60-62), and wherein the electronic movement of the focal point of the cone beam of x-rays is performed by electronically moving the electron beam (fig. 1, #19).

11. Regarding claim 7, Lanzara et al. discloses a system which comprises: a table (col. 3, line 65) for supporting a subject in a cylindrical region of interest disposed along an axis (fig. 1, #11); an x-ray source (fig. 1, #12) for producing a beam of x-rays (col. 2, lines 60-62) directed into the cylindrical region of interest (fig. 1, #11); an array of detectors (fig. 1, #26) disposed around a portion of the cylindrical region of interest (fig. 1, #11) and oriented to detect (fig. 1, #26) x-rays in the beam after they pass through the region of interest (fig. 1, #11); a gantry (fig. 3, #46) for supporting the x-ray source (fig. 3, #12) and array of detectors (fig. 3, #14) and for rotating them (col. 3, lines 34-39) around the cylindrical region of interest (fig. 3, #11) in a plane perpendicular to the axis; means for electronically moving a focal point of the beam of x-rays to positions along the direction of the axis (fig. 1, #19); means for the rotation of the gantry (fig. 3) and the

electronic axial movement of the cone beam focal point (fig. 1, #19) in accordance with a prescribed scan pattern; and means for acquiring signals produced by detected x-rays during performance of the prescribed scan pattern and reconstructing an image therefrom (fig. 2).

However, Lanzara et al. does not seem to specifically disclose cone beams, means for directing, and a two-dimensional array of detectors.

Ooshima teaches cone beams (title and fig. 7, #17), means for directing (fig. 2, #23), and a two-dimensional array of detectors (paragraph 18, "2-dimensional detector 19").

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the system of Lanzara et al. with the cone beams, means for directing, and detector array of Ooshima, since one would be motivated to make such modifications for reducing artifacts (abstract, purpose) as implied from Ooshima and saving time.

12. Regarding claim 8, Lanzara et al. further discloses wherein the array of detectors (fig. 1, #14) extends substantially the entire axial length of the cylindrical region of interest (fig. 1, region between #13a and 13b).

13. Regarding claim 9, Lanzara et al. further discloses wherein the x-ray source (fig. 1, #12) includes an electron gun (fig. 1, #17) that produces an electron beam that strikes an anode (fig. 1, #21) to produce the beam of x-rays and the means for electronically moving the beam focal point along the axial direction (fig. 1, #19) moves the electron beam (fig. 1, #18).

14. Regarding claim 10, Lanzara et al. further discloses a collimator (fig. 11, #51) disposed between the array of detectors (fig. 11, #14) and the cylindrical region of interest (fig. 11, #11), which would necessarily be operable to reduce radiation from sources other than the x-ray source reaching the array of detectors (fig. 11, #14) due to the nature of the collimator.

15. Regarding claims 11 and 13, Lanzara et al. as modified above suggests a device as recited above. Lanzara et al. further discloses a second collimator (fig. 11, #23) disposed between the x-ray source (fig. 1, #21) and the cylindrical region of interest (fig. 11, #11).

However, Lanzara et al. does not disclose a collimator operable to limit an axial extent of a cone beam of x-rays reaching a region of interest.

Ooshima teaches a collimator operable to limit an axial extent of a cone beam of x-rays reaching a region of interest (fig. 3, #18).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to further incorporate the device Lanzara et al. with the collimator of Ooshima, since one would be motivated to make such a modification to better aim the radiation to the detector (fig. 3) as shown by Ooshima.

16. Regarding claims 14 and 15, Lanzara et al. as modified above suggests a device as recited above.

However, Lanzara et al. does not disclose wherein a cone beam of x-rays is shaped to intersect substantially all or a segment of the detectors in a two-dimensional array of detectors

when produced from any of said focal point positions along the direction of the axis and wherein said segment is includes substantially less than all the detectors in said array of detectors.

Ooshima teaches wherein a cone beam of x-rays (fig. 3, #17) is shaped to intersect substantially all or a segment of the detectors in a two-dimensional array of detectors (fig. 3, #19) when produced from any of said focal point positions along the direction of the axis (fig. 3, focal points from #15) and wherein said segment is includes substantially less than all the detectors in said array of detectors (fig. 3, #19).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to further incorporate the device Lanzara et al. with the intersecting of Ooshima, since one would be motivated to make such a modification to ensure that the detector is used efficiently without wasting time during imaging.

17. Claims 2, 6, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzara et al. and Ooshima as applied to claims 1 and 7 above, and further in view of Morgan (US Patent 6229870).

18. Regarding claim 2, Lanzara et al. as modified above suggests a method as recited above.

However, Lanzara et al. does not disclose wherein steps are repeated to acquire an additional set of image data with a second scan pattern that is interleaved with a prescribed scan pattern.

Morgan teaches wherein steps are repeated to acquire an additional set of image data with a second scan pattern that is interleaved with a prescribed scan pattern (col. 6, lines 1-3).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Lanzara et al. as modified above with the second scan pattern of Morgan, since one would be motivated to make such a modification for covering a larger volume (col. 6, lines 1-3) as shown by Morgan.

19. Regarding claims 6 and 12, Lanzara et al. as modified above suggests a method and device as recited above.

However, Lanzara et al. does not disclose wherein an x-ray source is comprised of a set of separate x-ray sources disposed along an axial dimension of a region of interest and the electronic movement of the focal point of the x-rays is performed by switching the separate x-ray sources on and off.

Morgan teaches wherein an x-ray source is comprised of a set of separate x-ray sources (figs. 3 and 4, #60_n and 70_n) disposed along an axial dimension of a region of interest (fig. 3, #44) and the electronic movement of the focal point of the x-rays is performed by switching the separate x-ray sources on and off (col. 5, lines 57-59).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method and device of Lanzara et al. as modified above with the separate sources and switching of Morgan, since one would be motivated to make such a modification for improving imaging time (col. 3, lines 1-3) as implied from Morgan.

20. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lanzara et al. and Ooshima as applied to claim 1 above, and further in view of Rasche et al. (US Patent 6865248).

21. Regarding claim 4, Lanzara et al. as modified above suggests a method as recited above. Lanzara et al. further discloses wherein the prescribed scan pattern includes moving the x-ray source around the region of interest (fig. 3, #12, and col. 3, lines 34-39) and periodically electronically moving the x-ray source along the axial dimension (col. 2, lines 60-62).

However, Lanzara et al. does not disclose scanning in response to a cardiac trigger signal.

Rasche et al. teaches scanning in response to a cardiac trigger signal (col. 3, lines 46-55).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Lanzara et al. as modified above with the scanning response of Rasche et al., since one would be motivated to make such a modification to achieve higher image quality (col. 2, lines 18-24) as implied from Rasche et al.

22. Regarding claim 5, Lanzara et al. further discloses wherein the x-ray source is moved once around the region of interest during the performance of the prescribed scan pattern (fig. 3, #12, and col. 3, lines 34-39) and the x-ray source is electronically moved a plurality of times along the full extent of the axial dimension (col. 4, lines 43-46).

23. Claims 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hu et al. (US Patent 5430783) in view of Mistretta et al. (US Patent 5873825).

24. Regarding claims 16-18, Hu et al. discloses a method comprising the steps of producing a cone beam of x-rays (abstract, lines 3-4) with an x-ray source (fig. 5, #10) and directing it into a region of interest (fig. 5, #42), detecting x-rays (fig. 5, #44) in the cone beam after they have passed through the region of interest (fig. 5, #42), controlling a scan pattern of the x-ray source (fig. 5, #10) by moving it around the region of interest (fig. 5, #42) and moving it electronically to positions along an axial dimension of the region of interest (fig. 5, #42) to acquire a first attenuation data set with a first spiral scan pattern (fig. 5, #22' to the right), and repeating step c) to acquire additional attenuation data sets with spiral scan patterns that interleave (fig. 5, #22').

However, Hu et al. does not disclose transforming acquired data to a corresponding series of k-space data sets, combining all of the k-space data from one of said k-space data sets with peripheral k-space data from another, temporally adjacent k-space data set, and reconstructing an image from the combined k-space data to produce a series of images.

Mistretta et al. teaches transforming acquired data to a corresponding series of k-space data sets, combining all of the k-space data from one of said k-space data sets with peripheral k-space data from another, temporally adjacent k-space data set (col. 8, lines 9-17), and reconstructing an image from the combined k-space data to produce a series of images (col. 9, line 16-17).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Hu et al. with the transforming and combining of Mistretta et al., since one would be motivated to make such a modification to reduce image artifacts (col. 10, lines 1-10) as implied from Mistretta et al.

25. Regarding claims 19-21 and for purposes of being concise, Hu et al. discloses a method as recited above.

However, Hu et al. does not disclose reconstructing an image by combining all of the data from data sets with a part or less than all of the data from a temporally adjacent attenuation data set to produce a series of images and wherein said data sets are processed before being combined.

Mistretta et al. teaches reconstructing an image by combining all of the data from data sets with a part or less than all of the data from a temporally adjacent attenuation data set (col. 8, lines 9-17) to produce a series of images (col. 9, line 16-17) and wherein said data sets are processed before being combined (col. 8, lines 9-17).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the method of Hu et al. with the reconstructing and processing of Mistretta et al., since one would be motivated to make such a modification to reduce image artifacts (col. 10, lines 1-10) as implied from Mistretta et al.

Conclusion

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Saito et al. ("Large area 2-dimensional detector for real-time 3-dimensional CT (4D-CT)") discloses a 2-dimensional detector.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (571) 272-2492. The examiner can normally be reached on M - F (9 am to 5 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gk

EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER